

Immunology assignment 1

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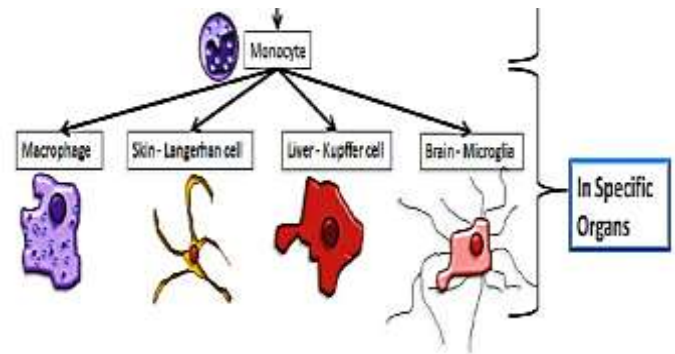
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1) Mention the types of macrophages in the different tissues?

The macrophages in the blood are known as monocytes or blood macrophages.

The monocytes leave the circulation and reach various tissues and become transformed, to macrophages with morphological and functional features characteristic of the tissue, such as Kupffer cells in liver, alveolar macrophages in the lungs, Langerhans' cells in skin, osteoclasts in bone, microglia in the CNS. These macrophages proliferate and survive for months.



2) Natural Killer Cells

Natural killer (NK) cells: are **large, granular lymphocytes morphologically related to T cells, which make up 10–15% of blood leukocytes.** NK cells **contribute to innate immunity by providing protection against viruses and other intracellular pathogens.** NK cells have the ability to **recognize and kill virus-infected cells and tumor cells.**

NK cells express two types of surface receptors:

- (1) lectin-like NK-cell receptors that bind proteins not carbohydrates and
- (2) killer immunoglobulin-like receptors (KIRs) that recognize the major histocompatibility complex (MHC) class I molecules.

These NK-cell are:

- a) Its receptors have both activation and inhibition properties.
- B) contain large amounts of granzyme and perforin, substances that mediate the cytotoxic actions of NK cells.
- c) antibody production is initiated in the adaptive immune response.
- d) NK cells play a critical role in antibody-dependent cellular cytotoxicity (ADCC). In this process, specific antibody binds to the target cell surface.
- e) The NK cell has Fc receptors that bind to the Fc portion of the attached antibody and kill the cell. This property allows the NK cell another opportunity to inhibit the replication of viruses and intracellular bacteria.
- f) NK cells and the IFN system are both integral parts of innate immunity that communicate with each other.
- g) NK cells are one of the three primary sources of IFN- γ , a potent antiviral and immune

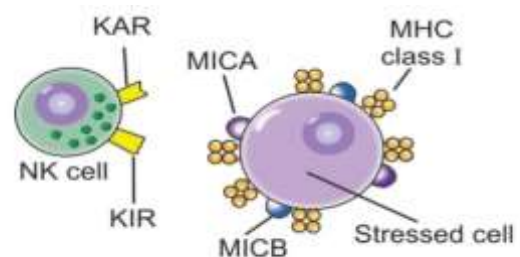


Fig. 3.4: Killer cell activation receptors (KARs) and killer cell inhibition receptors (KIRs) are expressed on NK cells. On nucleated cells, KARs detect stress-related molecule, MICA and MICB, while KIRs detect MHC class I molecules.



regulating cytokine. Moreover, the lytic activity of NK cells is enhanced by the type 1IFNs (IFN- α and IFN- β).

These two cytokines are actually induced by the invading virus. Innate lymphoid cells (ILCs) are a recently described group of innate immune cells that play a key role in regulating tissue immunity. Although these cells can be found in lymphoid and non-lymphoid organs, they have been reported to preferentially populate the barrier tissues of the skin, intestine, and lung. Because of their unique location, ILCs are among the first immune cells to respond to pathogens. These cells are defined by their lymphoid morphology and their lack of cell lineage markers for T cells, B cells, and other immune cells. To date, three types of ILCs have been identified by their cytokine profile and distinct transcription factors: ILC1 produces IFN- γ , ILC2 produces IL-5 and IL-13, and ILC3 produces IL-17A and IL-22. In the main, these cells play a major role in protecting the individual; however, recently they have been implicated in pathogenesis of certain inflammatory skin disorders, such as psoriasis.

3) Dendritic cells: are also **phagocytic and can degrade pathogens**; however, their main role is **to activate T cells in the adaptive immune response by acting as an antigen -presenting cell and by producing regulatory cytokines (eg, IFN- α).**

Dendritic cells are the class of APCs that initiate most immune responses. They are **found in nearly all tissues** including surface epithelia and T cell zone of lymphoid tissue and have a spidery cytoplasmic projections called dendrites.

The dendritic cells are smaller than the macrophage. They are not phagocytic and have no complement receptors **but they do possess class II antigen.**

These cells are often seen after antigenic stimulation, being surrounded by lymphocytes and are involved in the immune response.

. Dendritic cells: Resident immature myeloid-derived dendritic cells (mDC) continuously collect samplings from the interstitial fluids and are responsible for recognition of non-self-antigen. Mature mDC take residence in secondary immune organs.

a. Immature mDC:

- (1) Continuously process antigen for presentation to naive helper T cells.
- (2) Antigen is internalized by endocytosis and processed in lysosome and inserted into MHC Class II molecules.
- (3) Exposure to PAMP induces maturation of the (mDC) .
- (4) mDC migrates to lymph node.

b. Mature mDC:

- (1) Reduces endocytosis activity.
- (2) Increases **(MHC) macrophage chemotactic protein** Class II antigen expression.
- (3) Increases expression of coreceptors CD80/88.
- (4) Potential to release IL-12 depending on the identity of triggering **PAMP (pathogen associated molecular patterns).**

References:

- 1) Jawetz, Melnick, & Adelberg's Medical Microbiology Twenty-Eighth Edition. Chapter8
- 2) textbook of immunology sunil kumar mohanty k sai leela second edition. Chapter8
- 3) BRS, Board Review Series Microbiology and Immunology SIXTH edition chapter chapter 12

